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A Record of the Progress of Pharmacy and the Allied Sciences

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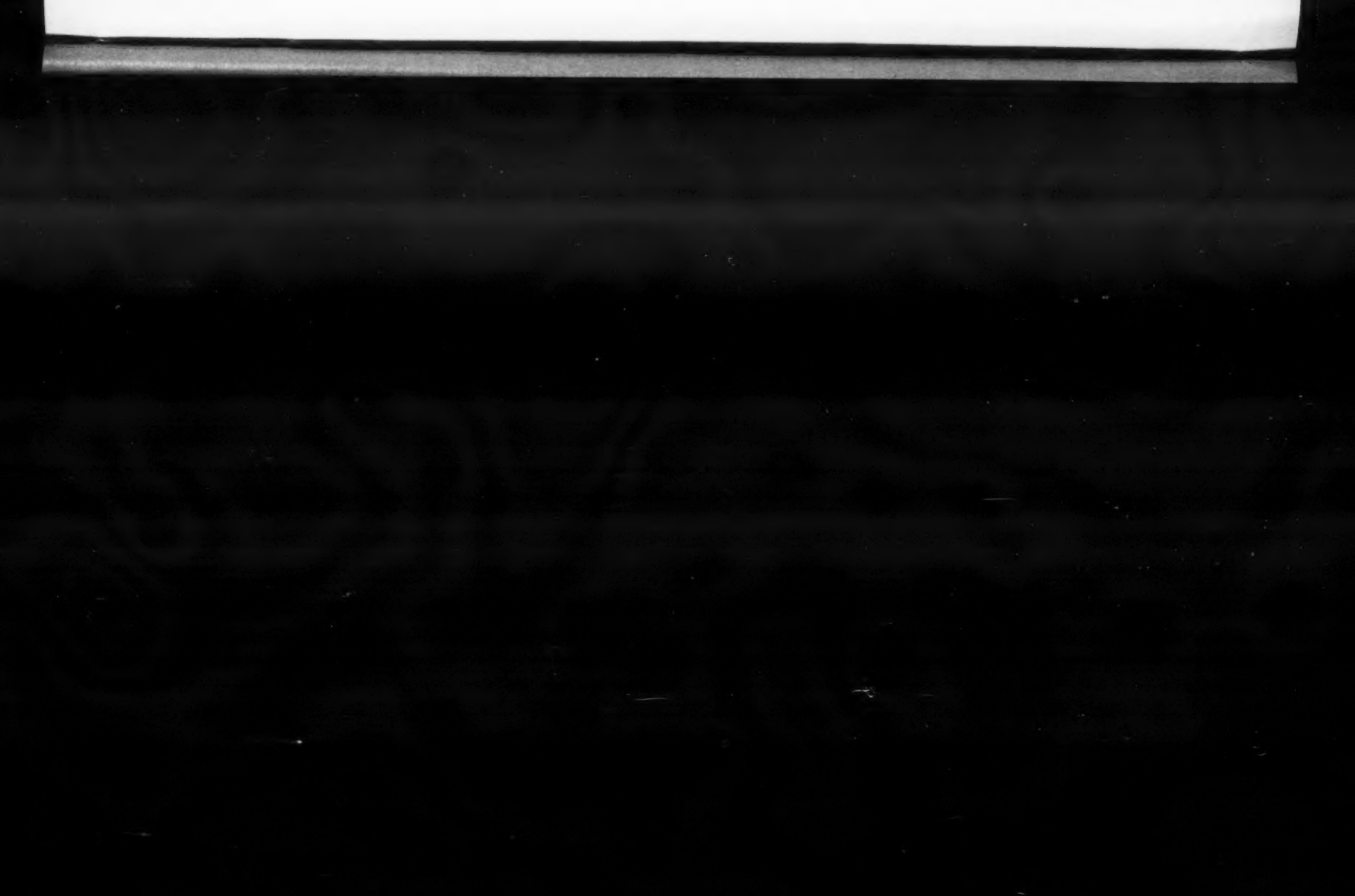

THE AMERICAN
JOURNAL OF PHARMACY

VOL. 105 FEBRUARY, 1933 NO. 2

EDITORIAL

AN UNUSUAL STATE CEREMONY

THE annual award of degrees to candidates in the several courses has been made, by most colleges, an event of serious dignity.

Through their academic lives students look forward to this important occasion with the keenest anticipation—and even in retrospect no disillusion ever comes to really spoil the Commencement thrill.

Professional graduates, however, know that beyond the glamour and the reward of their graduating days, lie still other obligations, and other worlds to conquer.

For they know that after the successful consummation of their College course comes their "trial by the people." Their training, though college certified, is not acceptable by the Government save after a strenuous, independent test conducted by the Government itself.

And this is a test that the doctor—the nurse—the pharmacist and others view with a real apprehension. Moreover, it is a test that has ordinarily been drab, mechanical and businesslike—and the awarding of the certificates a performance quite as perfunctory and unromantic.

The State of New Jersey, however, has a penchant for doing the unusual and worthwhile. On January 31, 1933,* some fifty-six persons who had been examined by that State, to test their competence as pharmacists, and who had successfully passed the examination, were gathered with their relatives and friends, in the vast Assembly Chamber of the State House at Trenton, the State Capital. There, each one of them publicly signed a pledge to conduct his professional career in conformity with the pharmaceutical code of ethics and to each one

*This was not, by the way, the first occasion of its kind held in New Jersey.

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of them was personally handed the State certificate, by the Hon. A. Harry Moore, Governor of the State. Dr. Robert L. Swain, President-elect of the American Pharmaceutical Association, delivered the principal address, which is printed elsewhere in this issue.

Members of the State Board of Pharmacy participated in the exercises, and indeed it is to them, and particularly to Dr. Fischelis, the able Secretary of the Board, that the credit goes for having in this manner, added a fine dignity to the heretofore colorless and unimpressive expression of public and governmental confidence in the competence of these professional novitiates.

It is a pity that such a ceremony is only possible in the smaller States, where the Capital can be reached from the furthest point in a matter of a few hours—for it must leave with the registrants an inspiration and a sense of obligation, not gained even at the College Commencement.

And so we say—more power to the State of New Jersey and to its enterprising and competent State Board of Pharmacy.

IVOR GRIFFITH.

MYSTERY OF FATAL PERUVIAN DISEASE SOLVED—The mystery that for forty years has surrounded the highly fatal Peruvian disease known as Oroya fever is finally being penetrated, it appears from a report in the *Journal of the American Medical Association.*

Dr. Ramón E. Ribeyro, professor at the National University of San Marcos of Lima, Peru, has finally shown that the outlook in this disease is good unless it is complicated by infection with an organism known as paratyphoid B bacillus. It is this complication which is responsible for the deaths that occur in cases of Oroya fever.

The mystery of this disease, comments the *Journal,* has taxed the ingenuity of numerous workers since Daniel A. Carrion in 1885 sacrificed his life to prove the identity of verruca peruana and Oroya fever. —(*Science News.*)

SELECTED EDITORIAL

SUPERVISION OF MANUFACTURE OF MEDICINES*

IT IS an anomaly in our legislation controlling the manufacture of drugs and medicines that, whilst the practising pharmacist is subject to stringent regulations, the operations of the "manufacturing chemist" are quite uncontrolled.

Beyond the necessity of complying with the legal standards and the labeling requirements of the Health Department and the Pharmacy Board, any incompetent person may style himself as a "manufacturing chemist" or "wholesale druggist" and set up a "factory" in his own backyard. No one is concerned how he compounds his drugs and under what conditions the medicines he puts on the market are manufactured.

In Canada this question has been dealt with in a practical way. It came prominently before the Canadian Pharmaceutical Association Convention which was held in Vancouver in 1929, when the following notice of motion was submitted:—

> "Whereas it is reported that there are a number of laboratories throughout Canada for the compounding of drugs, medicines and chemicals intended for internal and external use; that many of these laboratories are in charge of persons who not only have no standing with Pharmaceutical Associations, but have little or no pharmaceutical training; and whereas certain of these preparations contain poisons, it is considered that the safety of the public demands that the preparation of these medicines shall be under competent supervision."

Before the resolution was dealt with it was found that any reform would have to come through the medium of the Provincial Pharmacy Acts, as the Federal Government had not the power to pass the necessary legislation to correct the evil.

Since 1929 four Provinces have had included in their Pharmacy Acts a clause dealing with the question of supervision of the manufacture of medicines. The Nova Scotia Act contains this provision:—

*Reprinted from the *Australasian Journal of Pharmacy.*

> "Every laboratory in which drugs and medicines are compounded for sale either by retail or wholesale shall be under the personal supervision of a pharmaceutical chemist."

In New Brunswick and Manitoba a similar section is included in the Provincial Acts. The Alberta Act reads as follows:—

> "Every place in which drugs or medicines are compounded for sale either by retail or wholesale shall be under the immediate personal supervision of, and shall be bona fide managed and conducted by a pharmaceutical chemist."

The Canadian legislation might well be adopted in Australia. It is unnecessary to stress all the reasons why every place where drugs and medicines are compounded should be under qualified control. The principal reason is that in the public interest some such control is necessary.

We feel certain that a law on the lines of the Canadian amendments above referred to would be acceptable to all bona fide manufacturers and wholesale druggists. It rests with each State Government to introduce the requisite legislation to give effect to the suggestion, and this could best be done by a simple amendment of the existing pharmacy.

Editor's Comment—Annually we spend some 360 millions of dollars in this country for patent medicines of all classes, many of them, uncompromising frauds and pharmaceutical monstrosities. Such a superintendence as is advocated in the foregoing editorial would operate in this country also—to reduce the cost of medical care and to make such medicines safe for the new democracy. Then, too, there would be the correction of the manifest injustice that gives an untrained man privileges equal in such respects to those granted the well-trained individual.—*I. G.*

ORIGINAL ARTICLES

AN INVESTIGATION OF THE DIURETIC PROPERTIES OF WATERMELON JUICE [1]

By A. Richard Bliss, Jr.,[2] Robert W. Morrison [3] and E. O. Prather, Jr.[4]

Introduction

THE object of this study was to determine the accuracy of the common statement that the juice of the watermelon is a "good diuretic." Watermelon is the fruit of the trailing vine *Citrullus vulgaris,* a native of Southern Africa, cultivated in Egypt and the Orient since very early times, and now widely cultivated throughout the world. The literature yields meager information concerning watermelon *juice,* most work having been done with the seeds. Chatfield and McLaughlin (1) give the average composition of the edible portion of watermelons as follows: water, 42.4%; protein (N x 6.25), 0.2%; fat, 0.1%; ash, 0.1%; carbohydrates: total by difference, including fiber, 3.2%; fiber, 0.3%; sugars as invert, 2.8%; acid as malic acid, 0.01%; fuel value: per 100 gm., 14; per pound, 65. Rusby (2) states that "One of the most valuable and reliable simple diuretics is ordinary watermelon fruit, used freely and regularly during its season. The effect is in some degree due to the large amount of water it contains, but the same amount of water ingested does not produce an equal diuretic action. Watermelon seeds possess a similar property and are extensively used in domestic practice for this purpose." Culbreth (3) asserts that watermelon has "diuretic, taenifuge and anthelmintic properties." He probably refers to the seeds as do most of the references found in the available literature.

Wall (4) says the seeds are diuretic, demulcent and anthelmintic, and that the dose, in the infusion, is practically *ad libitum.* Wall and Suppan (5) make similar statements. Remington and Wood (6)

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[3] Associate Professor of Pharmacology, University of South Carolina.

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state that "the seeds are employed to a considerable extent as a domestic remedy in strangury and other affections of the urinary passages, and that Russian peasants are said to employ watermelon in the treatment of dropsy, urinogenital affections, chronic hepatic congestion, and chronic intestinal catarrh." De Jongh (7) reports the success of watermelon seeds followed by castor oil as an anthelmintic in a case of infestation with Taenia nana.

Manassein (8) found that "watermelon honey" produced "a very powerful diuretic effect on the lower animals, and in overdosage caused a fall in arterial pressure, rapid pulse, and death from cardiac paralysis."

Seward (9), Althausen and Kerr (10), and Barksdale (11) investigated the effects of extracts of watermelon seeds on high blood pressure. Lutochin (12), (13) reports the sugar content of watermelon, and the value of watermelon syrup as a food. Power and Solway (14), (15) report the composition of watermelon seeds, and the presence of a fixed oil in the seeds which is very similar to that found in pumpkin seeds. Lloyd (16) calls attention to the remarkable similarity in the appearance of the common watermelon vine and Colocynthis. A news item (17) in *The Chemist and Druggist* states that dried watermelon rinds have been used in Hungary in the preparation of a theobromine substitute.

The Method

The juice of fresh watermelons bought during June, July, August and September, 1932, in the open market of Memphis, Tennessee, was prepared as needed by simple expression. Adult rabbits of uniform weight and age were used as the experimental animals. The animals were isolated in individual metabolic cages, and careful observations over a sufficient number of days established whether each animal was in a state of metabolic equilibrium. The animals were kept on a complete and balanced diet determined for the individual animal. The daily water intake was carefully controlled by stomach tube, and the total volume of daily urine-output accurately measured and recorded.

Twenty-seven rabbits, divided among seven groups, were used. The *first group* received by stomach tube in the place of the water administered during the preliminary observation period an equal volume of the watermelon juice. The *second group* was given a mixture of equal volumes of fresh watermelon juice and water. A *third*

group ingested a mixture of two-thirds by volume of the juice and one-third of water; a *fourth group,* one-third watermelon juice and two-thirds water; a *fifth group* received a water-bath concentrate of the fresh juice which represented four times the strength of the original juice; a *sixth group* was administered a mixture of two-thirds by volume of the four-times concentrate and one-third water; and the *seventh group* received a water-bath concentrate which represented eight times the strength of the fresh juice.

Observations

The results obtained are compiled in the six tables which follow. A study of Tables I, II and III discloses the fact that the animals which received (a) the fresh juice only, (b) the mixture of equal volumes of fresh juice and water, (c) the mixture of 2/3 juice and 1/3 water, and (d) the mixture of 1/3 juice and 2/3 water showed: (1) little or no increase in the daily total output of urine, with the exception of rabbit #11, which showed a decided increase in the daily urine-output during the period in which the 2/3 juice—1/3 water mixture was administered; or (2) a decrease in the daily urine-output.

TABLE I. EFFECTS OF FRESH JUICE

Rabbit	Daily Fluid Intake	Aver. Daily Output	No. Observ. Days
#1:	100 cc. of Water*	44.5 cc.	7
	100 cc. of Juice*	47.0 cc.	14
#2:	100 cc. of Water	47.2 cc.	7
	100 cc. of Juice	48.1 cc.	18
#3:	100 cc. of Water	45.0 cc.	7
	100 cc. of Juice	44.0 cc.	14
#4:	100 cc. of Water	43.0 cc.	17
	100 cc. of Juice	41.2 cc.	18
#5:	100 cc. of Water	45.0 cc.	7
	100 cc. of Juice	48.0 cc.	14

*Note: One-half of the fluids administered in the morning, the other half in the evening.

TABLE II. EFFECTS OF EQUAL VOLUMES OF JUICE AND WATER

Rabbit	Daily Fluid Intake	Aver. Daily Output	No. Observ. Days
#6:	150 cc. of Water	65.0 cc.	7
	150 cc. of Mixture	63.1 cc.	10
#7:	150 cc. of Water	59.8 cc.	7
	150 cc. of Mixture	66.7 cc.	10
#8:	150 cc. of Water	63.0 cc.	7
	150 cc. of Mixture	66.0 cc.	10
#9:	150 cc. of Water	65.4 cc.	7
	150 cc. of Mixture	63.1 cc.	10

TABLE III. EFFECTS OF MIXTURES OF JUICE 2/3 AND WATER 1/3, AND JUICE 1/3 AND WATER 2/3

Rabbit	Daily Fluid Intake	Aver. Daily Output	No. Observ. Days
#10:	150 cc. of Water	66.5 cc.	7
	150 cc. of 2-1 Mixture	68.7 cc.	7
	150 cc. of 1-2 Mixture	66.5 cc.	7
#11:	150 cc. of Water	67.5 cc.	7
	150 cc. of 2-1 Mixture	86.2 cc.	7
	150 cc. of 1-2 Mixture	52.5 cc.	7
#12:	150 cc. of Water	60.7 cc.	7
	150 cc. of 2-1 Mixture	57.0 cc.	7
	150 cc. of 1-2 Mixture	53.5 cc.	7
#13:	150 cc. of Water	62.5 cc.	7
	150 cc. of 2-1 Mixture	61.0 cc.	7
	150 cc. of 1-2 Mixture	58.2 cc.	7
#14:	150 cc. of Water	59.0 cc.	7
	150 cc. of 2-1 Mixture	63.0 cc.	7
	150 cc. of 1-2 Mixture	53.0 cc.	7

Table IV shows that four out of five of the animals on the 4 x concentrate died in from four to fourteen days after beginning the ingestion of the concentrated juice. All of the animals developed a diarrhea on the fourth day. The abdomens were badly distended with gas, and autopsies disclosed intense irritation of the digestive and the urinary tracts. All four of the animals which died had ruptured urinary bladders, and one animal had in addition a perforation of the stomach.

TABLE IV. EFFECTS OF 4 x CONCENTRATE

Rabbit	Daily Fluid Intake	Aver. Daily Output	No. Observ. Days
#15:	100 cc. of Water	43.0 cc.	7
	100 cc. of Concentrate	33.0 cc.	18
#16:	100 cc. of Water	48.0 cc.	7
	100 cc. of Concentrate	27.1 cc.	Died* 11th Day
#17:	100 cc. of Water	50.0 cc.	7
	100 cc. of Concentrate	42.5 cc.	Died* 15th Day
#18:	100 cc. of Water	52.5 cc.	7
	100 cc. of Concentrate	32.1 cc.	Died* 4th Day
#19:	100 cc. of Water	53.0 cc.	
	100 cc. of Concentrate	30.2 cc.	Died* 14th Day

*Note: These animals developed a diarrhea the fourth day on the concentrate. The animals' abdomens were badly distended. In each case autopsies disclosed an intense irritation of the gastrointestinal and urinary tracts. Animals #16, 17, 18, 19 had ruptured urinary bladders; and #17 had in addition a perforation of the stomach.

Three of the four animals which had received a mixture of two-thirds of the 4 x concentrate of the juice and one-third water by volume died on the fourth or the seventh days following the ingestion of the mixture (Table V). There was evidence of similar irritation of the urinary and digestive tracts observed in the series immediately preceding, although it was not so intense. Two of the rabbits had perforations in the fundic portion of the stomachs.

TABLE V. EFFECTS OF 4 x CONCENTRATE 2/3 AND WATER 1/3

Rabbit	Daily Fluid Intake	Aver. Daily Output		No. Observ. Days
#20:	150 cc. of Water	62.7 cc.		7
	150 cc. of Mixture	56.2 cc.		8
#21:	150 cc. of Water	66.7 cc.		7
	150 cc. of Mixture	38.0 cc.	Died*	4th Day
#22:	150 cc. of Water	58.5 cc.		7
	150 cc. of Mixture	29.2 cc.	Died*	4th Day
#23:	150 cc. of Water	64.0 cc.		7
	150 cc. of Mixture	39.6 cc.	Died*	7th Day

*Note: Gastroenteritis was observed in each case; also some irritation of the urinary tract. Rabbits #21 and #23 had perforations in the fundic portion of the stomachs.

All four of the rabbits which had ingested the 8 x concentrate of the juice died, three of them on the second day of the concentrate ingestion, and the other animal on the fourth day. These animals, too, were badly distended with gas, and autopsies disclosed severe gastroenteritis and marked irritation of the urinary tract. Three of the four cases (the animals which died on the second day) had perforated stomachs.

TABLE VI. EFFECTS OF 8 x CONCENTRATE

Rabbit	Daily Fluid Intake	Aver. Daily Output		No. Observ. Days
#24:	100 cc. of Water	49.0 cc.		7
	100 cc. of Concentrate	32.0 cc.	Died*	4th Day
#25:	100 cc. of Water	48.0 cc.		7
	100 cc. of Concentrate	10.2 cc.	Died*	2nd Day
#26:	100 cc. of Water	56.0 cc.		7
	100 cc. of Concentrate	24.0 cc.	Died*	2nd Day
#27:	100 cc. of Water	58.0 cc.		7
	100 cc. of Concentrate	14.0 cc.	Died*	2nd Day

*Note: All animals were greatly distended with gas. Autopsies disclosed severe gastroenteritis and marked irritation of the urinary tract. In cases #25, #26 and #27 the stomachs were perforated.

Discussion

In rabbits, fresh watermelon juice produces (a) no effect on the daily urine-output, or (b) a slight decrease in the output of urine, or (c) a slight increase in the daily volume of urine voided. Consequently, in these animals, it is not an efficient diuretic.

The effects produced in the rabbits by water-bath concentrates of the fresh juice indicate that there is some irritating substance either in the fresh juice of the watermelon or formed when the juice is concentrated on the water-bath; and that this substance is capable of producing profound local and remote local irritation of the digestive and the urinary tracts. The identity of this substance has not been determined, as yet, by these investigators. Further studies are in progress, including an investigation of a concentrate produced in vacuo.

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A TEST FOR ASPIRIN, SALICYLIC ACID AND MANGANESE

By Charles C. Fulton

Associate Chemist, U. S. Industrial Alcohol Bureau, Minneapolis, Minn.

SALICYLIC acid (ortho-hydroxybenzoic acid) or aspirin (acetylsalicylic acid), treated with hydrogen peroxide, ammonia, and a dilute solution of a manganous salt, develops a pink or red color, changing to brown. Phenols in general and their acetyl derivatives, including salicylic acid and aspirin, give a color test of this kind with peroxide, ammonia, and a *copper* salt, but aspirin and salycilic acid seem to be the only ones that give the reaction with manganese.

Even meta-hydroxybenzoic acid, which reacts fairly well with copper, is practically negative to manganese, while para-hydroxybenzoic acid gives the test only very poorly even with copper, and not at all with manganese.

Treat some aspirin or salicylic acid in a test tube with 3 cc. water, 0.5 cc. hydrogen peroxide solution (3%), and 0.5 cc. ammonium hydroxide solution (1 part concentrated ammonia plus 2 parts water). Then add a drop at a time of dilute manganous sulfate solution, containing about 1 part manganese per 5000 parts of solution, shaking and mixing thoroughly with each drop. Four or five drops may be added. Aspirin develops a pink to red color which soon changes to brown. Salicylic acid develops a salmon to bright red color, gradually changing to brown. The two do not react quite the same.

It requires about a 1:500 solution of copper to produce an effect similar to that of the 1:5000 solution of manganese. Some phenols however are approximately as sensitive to copper as aspirin and salicylic acid are to manganese. Copper will develop the color with a little less aspirin or salicylic acid, but the manganese test is of course far more characteristic. It is also sufficiently sensitive: the manganese reaction is obtained with about 0.02 gm. aspirin.

The reaction may be used as a test for small quantities of manganese:

(1) Aspirin test. Treat about 0.1 gm. aspirin in a test tube with 5 cc. aqueous manganous solution to be tested; add 0.5 cc. H_2O_2 and 0.5 cc. NH_4OH (1 + 2), and mix. The following table shows the nature of the result:

Manganese in solution tested.	Result.
None	no color.
1/10,000,000	develops brownish in about 30 minutes.
1/5,000,000	brownish-pink tint (down tube) in 5 to 10 minutes; changes to brownish.
1/2,000,000	light pink in 30 to 60 seconds; good brownish-pink in 2 to 3 minutes; pink-brown in 10 to 15 minutes.
1/1,000,000	pink tint almost at once, changing to good brownish-pink, then to brown.
1/500,000	pink at once, quickly good dull red; changing to brown within 5 minutes.
1/100,000	pink at once, soon dull red, changing to brown.
1/30,000	strong red quickly, changing to brown in about 1 minute.
1/10,000	strong brownish-red, changing to dark brown soon.

(2) Salicylic acid test. Dissolve about 0.3 gm. salicylic acid in 1 cc. ammonium hydroxide (1 + 2) and 0.5 cc. hydrogen peroxide (3%). Add 5 cc. of the manganous solution to be tested and mix.

Manganese in solution tested.	Result.
None	very slight yellowish tint.
1/10,000,000	orangish-yellow tint in about 10 minutes; light orange in about 30 minutes.
1/5,000,000	orangish-yellow tint in 2 to 3 minutes; light orange in about 10 minutes (red down tube).
1/2,000,000	orangish-yellow tint in 1 minute; salmon in 3 to 5 minutes; bright red to brownish-red within 10 minutes.
1/1,000,000	light salmon within 1½ minutes; bright red within 5 minutes.
1/500,000	salmon-pink within 1½ minutes; fairly strong red in 5 minutes, deep red in 10 minutes.
1/100,000	pink-salmon, changing to pink-red in 1 minute; changing to orange-red, then to dark red in 3 minutes.
1/50,000	pink-salmon, changing to bright red in 1 minute; soon dark red.

Concentrations of manganese markedly greater than 1/50,000 do not give good results in this test.

Tests such as these cannot be expected to succeed with more concentrated manganese solutions than 1/10,000, at best, because the manganese is oxidized to MnO_2 by the oxygen catalytically set free, and precipitates. With the procedure as above, but omitting the aspirin or salicylic acid, the 1/10,000 manganese solution gives a brown color and gradually a brown preciptate, the 1/100,000 solution a brownish-yellowish tint, becoming a brown-yellow color, the 1/1,000,000 solution no color.

DRUG-ROOM OF HOSPITAL—An Associated Press dispatch announced September 16 that three patients at the Longview Hospital for the Insane, Cincinnati, Ohio, died as a result of an improperly prepared anesthetic solution. A tonsillectomy had been done in each instance, evidently under local anesthesia. The superintendent of the hospital stated that the nurse who prepared the anesthetic formula had only lately been in charge of the drug-room. She misread the abbreviation "grs." for "grms." The press account states that the first patient injected reacted strangely, which was attributed to asthma, from which she suffered. The second patient slumped following the injection, but her condition was such as not unusually seen with her. But when the third victim showed an undue reaction, the attaches became apprehensive, and immediately began restorative measures. A subsequent report states that as a result of this occurrence one of the medical staff resigned.

(It is rather difficult always to draw conclusions from press reports. Evidently these patients were injected one right after the other, and being inmates of an institution for the mentally ill, the undue reactions were attributed to their mental condition. The interesting part is that the solution was prepared by a nurse, specified lately in charge of the drug-room. *If this individual is not a qualified or registered pharmacist, why was she permitted to assume the duties in the drug-room?—Editor, The Penna. Med. Jour.*, Jan., 1933, *274.*) *274.*)

BETA NAPHTHOL TEST FOR COPPER

By Charles C. Fulton

Associate Chemist, U. S. Industrial Alcohol Bureau, Minneapolis, Minn.

AN AMMONIACAL solution of beta naphthol in dilute alcohol assumes a light pink color; in the presence of copper the color becomes a cloudy yellowish green of oily appearance. The test easily detects as little as 1 part of copper per 3,000,000 of solution, if the test mixture is allowed to stand for 2 or 3 hours. Tests for minute proportions of copper should be run in comparison with a blank, as even when no copper is present the pink will change slowly, on standing overnight or a similar length of time, to a weak yellowish-greenish color. The difference, however, between a blank and a 1 to 3,000,000 copper solution is unmistakable.

The procedure is as follows:

Dissolve about 0.04 gm. beta naphthol in 2 cc. alcohol in a test tube, add 0.5 cc. ammonium hydroxide solution (1 part conc. NH_4OH plus 2 parts water), and follow at once with 5 cc. of the aqueous solution to be tested for copper.

The beta naphthol need not be weighed exactly, but if much more than 0.04 gm. is taken it will be precipitated when the water is added. Too much alcohol will cause the color to develop as brown instead of green; the alcohol therefore should not exceed about 3 cc. at most. Too much ammonia will prevent the test or reduce its sensitivity; 0.5 cc. of the diluted ammonia as directed is all right, but less could be used. The reaction does not take place with alkali. It is best to follow the ammonia quickly with the copper solution, but a few minutes' delay will not prevent the reaction, only reduce the sensitivity a little.

The results of the test with various proportions of copper are shown in the following table:

Copper.	Result.
None	solution light pink; remains so for more than 2 hours.
1/6,000,000	light pink; in 2 hours light pinkish-brownish.
1/3,000,000	light pink; in about 15 minutes changes to yellowish; 30 minutes greenish-yellow; 2 hours light yellow-green.

1/1,000,000	light pink; in about 12 minutes changes to yellowish; 30 minutes greenish-yellow; 2 hours light yellow-green.
1/300,000	yellowish within 1 minute; greenish-yellow in 3 to 5 minutes; yellow-green in 10 minutes.
1/100,000	yellowish in about 30 seconds; yellow-green within 1 minute; becomes strong cloudy yellow-green of oily appearance.
1/30,000	greenish-yellow almost at once, quickly changing to yellowish-green; becomes strong, cloudy, oily yellowish-green.
1/10,000	greenish almost at once, soon deepening to strong green; becomes strong, dark, oily green.
1/5,000	bluish-green, soon strong green; becomes strong, dark bluish-green.
1/1,000	blue (copper-ammonia color), changing to strong, dark bluish-green within 1 minute; becomes green-black.

CHEMIST SUGGESTS WARNING ODOR FOR POISONOUS TABLETS—Adding a warning odor and taste to bichloride of mercury tablets would help to reduce the number of accidental poisonings by these deadly tablets, suggests Dr. R. E. Rose, director of the technical laboratories of E. I. du Pont de Nemours Company, Wilmington, in a note in *Industrial and Engineering Chemistry*.

Attention recently has been drawn to the importance of making these tablets a distinctive color and shape. Specifically, Dr. Rose suggests a drop of the higher fractions of synthetic alcohols for giving a warning odor that is both characteristic and not too disagreeable for use in the sick room, and a small quantity of a very bitter substance such as salt of quinine to give a characteristic warning taste.

NOTES ON CASCARA—PRELIMINARY REPORT

By J. Hampton Hoch

THE methods of assay to which drugs or their preparations are usually subjected in an effort to evaluate their efficacy can be classified as chemical, physical or biological. Only the first method has been used to any considerable extent for cascara or its preparations. A chemical assay is of value if it measures the therapeutically active substances or if the substances measured bear some significant relationship to the active compound or compounds.

Chemical methods of evaluating cascara have involved the determination of emodin, using either a gravimetric (1, 2, 3, 4, 4a), colorimetric (1, 5, 6, 7, 8, 9), volumetric (10), or spectroscopic (1) method. Since emodin is not the substance responsible for the activity of the so-called "emodin cathartics" (8, 11, 12), and since there is no evidence that its determination can be correlated with the therapeutic activity (13, 14), this approach is futile.

Physical determinations such as total extractive, manganese number, etc., are likewise useless, being no criteria of activity (15, 16).

Biologic methods of evaluation have but seldom been used and were generally based on the false premise that emodin was the active cathartic principle. Our present knowledge calls for a reinvestigation of the mode of action of cascara and the reconciliation of what are apparently contradictory statements. Until this is done any bioassay must be empiric. The following paragraphs are a recapitulation of the views put forth concerning the pharmacology of this drug.

Cascara sagrada and its preparations are usually classified as anthracene, anthraquinone or emodin cathartics, the action being said to depend upon the hydrolysis of certain glucosidal combinations. These glucosidic compounds are in themselves inactive (17), but when administered orally they are hydrolyzed or oxidized in the alkaline intestinal juices (18, 19) yielding active oxymethylanthraquinones; the action of these anthraquinones is graded by their slow liberation and by the presence of colloid extractives, about eight to twelve hours being required for a response. It is claimed that the anthraquinone cathartics act specifically (20, 21), or mainly (17, 22), on the colon and rectum (due partly to selective penetration), having no action on the small gut (23), presumably because they do not find suitable conditions for solution in the small bowel (24). The

plant anthraquinones act along the whole intestinal tract but bile takes no part in the glucosidal decomposition (25). Magnus (26) says that the site of action is the wall of the large gut itself. The defecation reflex is stimulated and the antiperistalsis of the colon inhibited (17) during the passage of the quinones through the bowel wall (25); the effect does not occur until the drug has had time to pass from the stomach to the colon (23).

Anthracene cathartics are said to increase peristalsis whether given by rectum (12) or whether injected subcutaneously (27, 28, 29) or intravenously (25, 28), the action in the latter two cases being local and dependent upon the constituents being excreted into the intestine. In mammals subcutaneous administration of small doses causes marked rise in body temperature by acting on the heat-regulating center of the central nervous system; large doses cause a fall in body temperature (30). Chistoni (31) and Walther (32) found, however, that hypodermic administration produced renal irritation but no catharsis, the constituents being rapidly absorbed and excreted by the kidneys.

Working with excised intestine, small doses were found to increase and large doses decrease the tonus (28), Meissner (33) recording that cascara inhibited contractions. Gruber and workers (34) find that when placed in the gut lumen the first response was a rise in general tonus followed by a decrease below control level and by introduction of peristaltic contractions. Flury (35) noted an increased rate but lessened intensity of contractions. When anthracene cathartics were placed in isolated loops of intestine no increase of intestinal secretion was noted (36); the tendency was to be absorbed (12).

Griping is thought (17) to be proportional to the severity of the irritation, being due partly to increased peristalsis, partly to direct irritation. Even large doses of anthracene cathartics do not increase secretion of intestinal fluid, nor do they draw water from the tissues; if not expelled they do not cause inflammation. Although it is generally claimed that the unaged bark of cascara has an emetic and griping action and that the cathartic principles develop on storing, these statements have been questioned (8, 37).

None of the pure principles are as satisfactory as the crude drug (38), perhaps because they are less soluble in the intestine (24), or because there is some synergism of its active soluble prin-

ciples (19). It is questionable whether the more active principles pass into the urine in appreciable amounts (24), because rapid absorption lessens the cathartic action and increases toxicity (19), although Bastedo (12) says they are eliminated without harm to the kidneys. Investigations as to the configuration of the derived anthraquinone molecule led Vieth to the conclusion that the presence of the methyl group has little influence, but that the position of the hydroxyl groups has some relation to the activity.

In summarizing the researches of previous investigators who studied the constituents of cascara, one is led to agree with Hauser (39) that the glucosides present are rhamnosides of the anthranols of chrysophanic acid, frangula-emodin monomethylether and cascarol. The changes taking place during the drying and ageing of the bark probably involve the oxidation of the anthranol glucosides to anthraquinone glucosides with some hydrolysis of the anthraquinone glucosides to free anthraquinone and sugar by the oxidase and anthraglucosidase ferments naturally present. The anthraquinone content, as is well known, increases during storage. Although most likely an integral part of the purgative complex, the anthraquinone derivatives have no cathartic properties.

The literature contains many conflicting statements concerning the chemistry and pharmacology of cascara and questions, arising like ghosts to haunt our pharmaceutical peace of mind, as to the correctness of our procedure in the preparation of cascara products can not at present be satisfactorily disposed of. Preliminary experiments were conducted in the hope of adding to the information available and answering a few of the questions that arise.

Experimental: Five portions of the same lot of cascara bark in the form of a moderately coarse powder were made into fluid extracts:

IA—Prepared according to directions of the U. S. P. X.

IIA—Prepared by first exhausting the drug with hot benzol, thoroughly drying the marc, and then extracting with boiling water.

IIIA—Prepared by exhausting the drug with hot benzol, drying, exhausting with hot ethyl acetate, thoroughly drying the marc, and then extracting with boiling water.

IB and IIB were prepared exactly as were IA and IIA excepting that 1 per cent. acetic acid was used as the menstruum in place of water.

Of these five extracts only IA (U. S. P. X) showed any activity when administered orally in normal (3 to 7 cc.) dosage. To determine activity, the subject, prior to testing, kept a careful record of time of feeding and defecation. No restrictions were placed on quantity or type of solids or liquids ingested (alcohol was banned), or on the amount of exercise; in other words the subject followed his normal routine of daily living. After preliminary records were available covering a period of seven to ten days, the U. S. P. fluidextract was administered in dosage sufficiently large to produce decided catharsis (7 cc.). In subsequent testing of the four other preparations this same dosage was used. The finely powdered bark was administered in 3 gm. dosage by suspending in water.

A commercial U. S. P. X fluidextract in 5 cc. dosage was effective with another subject. Hydrolysis with 4N HCl gave rise to an insoluble fraction (a); the filtrate was freed of anthraquinones by repeated shaking out with ether, the anthraquinones being recovered from the ether by shaking it with NH_4OH (b); the remainder of the filtrate was the third fraction (c). All three fractions (a, b, c) were inactive in dosages equivalent to 5 cc. of the original fluidextract. When given in dosages equivalent to 10 cc. of the fluidextract fraction "a" was still without activity; a combination of "b" and "c" showed slight activity, but markedly less than the 5 cc. dosage of the unhydrolyzed fluidextract.

Oxidation of the commercial U. S. P. X fluidextract with H_2O_2 gave rise to an insoluble fraction "m" which was inactive in dosage equivalent to 10 cc. of the fluidextract. The filtrate "n" was inactive in dosage equivalent to 5 cc. of the fluidextract.

Treatment with lead subacetate gave rise to a copious precipitate in the U. S. P. X fluidextract. This fraction "r" and the resultant filtrate "s" after being freed of lead were both found to be inactive in dosages equivalent to 9 cc. of the fluidextract.

Immediately following the administration of the various preparations and fractions thereof the urine of the subjects was tested at short intervals for the presence of anthraquinone bodies by means of the Borntraeger reaction. Heating the alkalinized urine always deepened the resultant color.

An appendecostomy on a dog enabled us to deliver an active preparation directly into the large gut through a catheter. Prior to administration the record of normal defecation was obtained; the

conditions maintained throughout were water and exercise ad libitum, measured quantity of patent dog food at same time each day, one feeding daily, individual wired enclosure. Small doses were without action but a large dose (6 cc.) evoked marked catharsis.

Rectal administration of an active preparation (IA) in 7 cc. dosage, by means of a catheter which was inserted up to the lower flexure of the sigmoid, did not evoke defecation although the same subject earlier showed marked cathartic action from oral administration of the same dose. Anthraquinones present in the urine showed that some absorption had taken place although not as rapid as when given orally.

Conclusions

1. Exhaustion of powdered cascara with hot benzol reduces the activity of the fluidextract subsequently prepared from it.

2. A fluidextract prepared with boiling 1 per cent. acetic acid menstruum is less active than one prepared with boiling water.

3. The present official fluidextract represents less than half the activity of its "equivalent" amount of finely powdered bark.

4. Hydrolysis and/or oxidation of the official fluidextract reduces its activity.

5. Anthraquinones present in or liberated by the hydrolysis of the fluidextract are not responsible for the cathartic action.

6. In man the time interval between oral administration and resultant defecation is fairly constant (eight-nine hours) and is no quantitative measure of activity.

7. Precipitation with lead subacetate does not isolate the "active" constituents of the fluidextract.

8. Anthraquinones appear in the urine within fifteen to thirty minutes after oral administration and are present in both "free" and "combined" state. Their appearance in the urine is not related to the activity of the preparation.

9. The introduction of large doses of the official fluidextract directly into the large gut of a dog produces catharsis.

10. Rectal administration in man was ineffective in normal dosage.

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EDUCATION—SEEN IN TERMS OF OBLIGATION*

By Robert L. Swain

President-elect, American Pharmaceutical Association

IN standing before this group, I am much impressed with the seting, the purpose, and the dignity of this occasion. So far as I am aware, this ceremony is unique. While all the States of the Union have long since had licensing boards for the purpose of passing on the professional and technical competency of those seeking admission to the practice of pharmacy, no other state has conferred its authority in so striking and impressive a manner. I extend my congratulations to the State of New Jersey for having, once more, established a precedent in the professional field, a precedent which seems to emphasize the duty of the citizen to the State, and of the State to the people themselves.

I should like, too, to extend my congratulations to the young men and young women for whom this ceremony was established. I am familiar with the arduous course of preparation which you have undergone. I know much of the difficulties you have had to face, and of the real labor required. When you first entered upon your course of studies, you were faced with years of intensive effort, perhaps beset with doubts and misgivings, and doubtless a bit apprehensive as to the outcome of it all. The experience turned out to be a pleasant and happy one, filled with recollections to which you will constantly recur. The journey on which you embarked some years ago has at last brought you to this happy hour. This great commonwealth is about to confer upon you its authority to engage in the practice of the profession to which you have aspired.

While you are entitled to a full measure of happiness on this occasion, I cannot refrain from calling to your attention that the authority which the State confers carries with a real and definite responsibility. The State regards you as qualified to take your place in society, and to minister to society, not alone from your professional skill and judgment, but in accordance with the broad qualifications that education confers. You have passed from the stage of preparation to that much more exacting and difficult stage, that of fulfillment.

*Read on the occasion of the Award of Certificates of Registration to Registered Pharmacists by the Board of Pharmacy of the State of New Jersey, January 31, 1933. See Editorial, this issue.

From now on you will be charged with the responsibilities and burdened with the duties necessarily incident to education. From now on you are to carry professional and civic responsibilities. How well you are to meet the situations with which you will be confronted is dependent upon your reaction to your problems, and this in turn comes from the mental and spiritual attitude which your education has created.

Various attempts have been made to define education. Some have seen it in terms of the systems by which it is produced; others as the justification of special theories or principles upon which the systems are based. Some have sought to consider it as the value of outward manifestations, the mere demeanor of educated people. Others have persisted in a more or less practical view, and have interpreted education on the basis of the use to which it is put. One expert in this field has said that education is simply the capability of using, to the best advantage, leisure hours, and this to him, meant the pursuit of art, culture, and the other elements entering into a well rounded and nicely balanced mental attitude. There are still others who see education from the standpoint of its function in the furtherance of social and economic progress.

No doubt, there is much in each of these views to commend it to reason. However, there seems to me still another view to be expressed. Education cannot be considered aside from the burdens which it imposes. To one who sees all effort, educational and otherwise, as a means to an end, responsibility becomes an essential attribute of these efforts. This utilitarian conception of education, regarding it simply as a means to an end, seems to be more in harmony with practical demands. It would seem difficult, if indeed not impossible, to separate responsibility for doing from the ability to do. Thus responsibility and education, to one who thinks he discerns a direct relation between human values and world movements, go hand in hand as balancing and compensating factors.

Whatever be the basic idea regarding the nature of education, it will perhaps be the general opinion that education does carry with it a definite responsibility. And, no doubt, general concurrence will be given the principle that education and responsibility occupy a more or less fixed relation, certainly to the extent of agreeing that the higher the education the greater the responsibility of the educated man. The more one considers present trends, in industry, politics, sociology, professional and scientfic pursuits, the more clearly he is

lead to interpret education in terms of its social obligation, and to evaluate it from the standpoint of its contribution to the general scheme of things.

Assuming that this view of the matter is reasonably sound, then it follows that the assumption of responsibility stimulates initiative, and initiative builds leadership. And what does the world need more today than leadership, earnest, intelligent, honest, and forceful leadership, a leadership based on a full realization of the needs of the hour, and a conscientious assumption of responsibility to meet them? This becomes a matter of profound regard when education is seen against the cold and menacing background of world economic and social distress. It seems now established that world problems will not yield to political creeds or social dogmas. The economist has been unable to propose the way out, and the diplomatist has added confusion to an already greatly troubled situation. All efforts have failed because individual consciousness has not been sufficiently aroused. There must be an awakening of individual responsibility, and the individual must see himself clearly against the horizon of the future. While the world must move forward in response to social pressure, underlying this is the quickening principle of individual responsibility. The time would seem peculiarly appropriate for proclaiming the doctrine of unified approach on the part of those to whom idealism is the source of practical deeds, and who recognize their obligation and responsibility to the day in which they live. If this could be done by stimulating an individual sense of duty, if this awakened consciousness could be made felt in all fields of effort, and if this, in turn, could be welded into a concerted and comprehensive scheme for betterment, it would seem to be a remedy for the prolonged distress which raises such grave doubts as to the future. What is really needed is a deep sense of individual responsibility. If this can be brought about, if each can be made to play his part, and play it well, if each can be made to see his relationship to the whole, the storm clouds will melt away, and the future faced with confidence and assurance.

What has this to do with us assembled on this auspicious occasion? As I visualize the situation, it means that as men trained for the practice of pharmacy, as men fitted for a specific professional service, as men qualified to make definite contributions to society, educated men, if you please, you are faced with great responsibilities

to the profession into which you have been admitted, and to the social organization of which your profession is a part.

What is our responsibility to our profession? The answer to this question comes from a due appreciation of what pharmacy is, the service it renders, and the educational structure upon which it stands. Pharmacy is variously defined. The Federal Office of Education, in the Department of the Interior, has adopted the following definition:

> "Pharmacy is the science which treats of medicinal substances. It embraces not only a knowledge of medicines and the art of preparing and dispensing them, but also of their identification, selection, preservation, combination, analysis, and standardization."

This definition is full and accurate, definite, and to the point. It defines a technical and professional field, involving many intricate and complex sciences. However, excellent as the definition is, it suffers from the limitation common to definitions as a class. It fails to distinguish between static and dynamic force. It fails to regard drugs and medicines from the standpoint of their use and importance. It does not call to mind the relationship of pharmacy to disease, it leaves unnoted the public health significance of pharmaceutical practice. It is a definition of a thing, but one that leaves out the spirit of the thing, those inherent qualities which make a thing living and real. It is a definition which fails to distinguish between a thing at rest, and a thing in action. The poet has caught the thought in the uncommonly beautiful and meaningful descriptive lines: "As idle as a painted ship upon a painted ocean." What a contrast between a ship plowing its way through the bounding seas, a majestic creation in a majestic setting.

Pharmacy must be seen as a service, as a public function, as an essential public health agency, as one making an unending contribution to the public welfare. Once pharmacy is seen in terms of what it does, once we grasp its real significance, it should receive our full loyalty and devotion.

Pharmaceutical education has, by slow and deliberate steps, finally reached a position of parity with the other public health professions so far as the time of preparation is concerned. An examination of the subject matter of the curriculum will impress everyone with its dignity on the one hand, and with its breadth and depth on

the other. While probably no one believes that the ultimate has been reached in the arrangement and content of the course, it cannot be denied that the place has at last been reached when sound educational principles and theories may be woven into the pharmaceutical fabric.

The trend in pharmaceutical education is to be found in the final report of the Committee on the Costs of Medical Care. "Pharmaceutical education," says the report, "should emphasize the pharmacist's responsibility for public health and safety. It should have a sound background, cultural and scientific. It should be more closely correlated with education in other public health professions in order to prepare pharmacists to cooperate fully with physicians, dentists, nurses, and public health agencies." In other words, pharmacy should become much more integrated into the public health scheme. This opinion is in direct line with the view held by thoughtful phamacists. It is important, however, as it represents the views of experts in public health and socialogical pursuits. It is a deliberate, impersonal, and unbiased view of a group best qualified to speak with authority.

It is difficult to escape the conclusion that, by and large, conditions existing in any group must be regarded as reflecting the complacency of the group. Improvement comes from an awakened consciousness. It is my opinion that pharmacy will become more expressive of its real professional purpose when pharmacists themselves begin to feel the uplift of that purpose. I can conceive of no greater duty than that facing pharmacists of today. That duty is clearly to shock the sensibilities of the profession to a realization of present conditions, certainly to the extent of questioning the wisdom of its present attitude. While the drug store will no doubt continue more or less commercial, its status, in the future, will, in my candid opinion, depend upon the degree to which it conforms to professional practice. The public is already beginning to note the incongruity of the activities in the modern type of drug stores. Physicians are becoming more discriminating and much more critical. Not only is this true, but pharmacists themselves are taking stock of the present situation, and are becoming skeptical of the soundness of the commercial development of the drug store. In the minds of many, skepticism has given way to doubt, and doubt has revolved itself into a conviction that placing a commercial emphasis on the drug store has been a tragic error. A distinguished pharmacist recently said: "Pharmacists in general have become discouraged with conditions in their

field, especially as regards the discouraging effects of the cut-price evil. They now seek their salvation in real pharmacy." The same thought was expressed recently by a nationally known public health administrator when he said, "that if pharmacists would really study their opportunities for rendering public health service and use them intelligently, the profession would be much freer from commercial pressure than is now the case." As I view the whole matter, the time is appropriate for an earnest study of existing conditions with the view of bringing about long needed adjustments in the pharmaceutical complex. The way back to individual responsibility, to a sane view of fundamental principles, is becoming more and more a matter of necessity.

It would thus seem necessary to work out and adopt a policy designed to foster the essential phases of pharmaceutical practice, and to follow it through until the drug store reflects the purpose it is designed to serve. Such a policy would include a fuller realization of the significance of pharmacy on the part of pharmacists themselves, a more intelligent conception of the relationship between the other public health groups, a properly balanced view of the commercial and professional aspects of the drug store, a more awakened sense of individual and professional responsibility, and an earnest study of the needs of the profession and their importance to the productive, distributive, and educational systems.

It is admitted that this program is complex and intricate, and that it bristles with difficulties of the first magnitude. However, if it be sound, postponing a facing of the issues simply multiplies the complications, intensifies the difficulties, and makes success indefinite and doubtful. However, involved in it all is the matter of professional security and individual and professional integrity. With no intention of minimizing the difficulty of this program, I do emphasize the need of giving earnest study and thought to our problems.

Pharmacy has wandered off to strange lands, and has erected unto herself strange gods. It will require unselfish devotion and intensive effort to bring her back to her rightful place. Be the difficulties ever so great, the job is ours.

GOLD—A KING AND A SERVANT *

By Freeman P. Stroup, Ph. M.

SCIENTISTS today are generally agreed that ninety-two is the total number of chemical elements possible, the term "element" being applied to a substance which is incapable of being resolved into anything simpler. Of these, all but one are certainly known, and there are several persons who claim to have discovered that one, but have not yet been able to have their claims generally accepted.

Freeman P. Stroup, Ph. M.

Of the ninety-two, the majority are known to scientists as *metals* because of their possessing certain *physical* properties, such as luster, fusibility, high specific gravity, opacity, malleability, ductility, ability to conduct heat and electricity; and possessing also certain *chemical* properties, particularly that of being acted upon by acids to form salt-like bodies in which the metal plays the part of the basic element.

Only so short a time ago as 1758, nearly 300 years after Columbus' discovery of America, and only a few decades before the United States became a nation, chemists knew of only seven metals—gold, silver, copper, tin, lead, iron, mercury (then known generally as quicksilver and not considered as a metal because it is neither malleable nor ductile). During the next fifty years the list increased to twenty-six, and included most of the metals used by man today as structural material, whether of watches, fine machinery, heavy machinery, bridges, towers, etc. The alkali-metals (sodium and potassium) and the alkali-earth metals (calcium, barium and strontium) were discovered shortly afterwards, and magnesium and aluminum still later.

This evening we are concerned about only one of these—known to English-speaking people as gold, to the alchemists (alchymists) as Sol (the sun).

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While it is entirely possible that copper and bronze (an alloy of copper and tin) antedated it in the service of man, it is quite probable that gold was the first metal discovered by man, and the making of ornaments the first use to which it was put. The color probably first called attention to it, and the ease with which it could be drawn out into wire or hammered into sheets and various shapes, together with the fact that small masses could easily be welded together into larger masses by hammering could easily have been learned, and recognized as useful properties.

Inscriptions on monuments indicate that "gold-washing" was practiced in Egypt nearly 6000 years ago. Articles of gold jewelry found on mummies of people who died 4000 years ago have been found in ancient tombs unearthed by archeologists in very recent years; and many other objects "overlaid" with gold found in some of these same tombs indicate that the practice of "gold-beating" was a very ancient art.

GEOGRAPHY

So far as history can enlighten us, the earliest known deposits of gold were at Colchis, west of the Caucasus, and others in Asia Minor. Egypt, Asia Minor, Italy, Greece, Spain, France and India are all known to have produced gold before the Christian Era. In the sixteenth century (400 years ago) it was being produced in Mexico, Peru, Colombia, Chile, all in the Western Hemisphere. Gold mining in the United States of America began in 1792 in the Appalachian Mountains. It was discovered in California in 1848, and in other western states later. Other parts of the world known for their production of large quantities of the yellow metal include: New Zealand, Australia, Russia and Siberia, Canada, Brazil and, particularly, South Africa which at present is the world's greatest commercial source of supply (58.42 per cent. in 1929). During the year 1929 the production of other parts of the world than Africa were: North America, 24.36 per cent.; Asia, 11.39 per cent.; Australasia, 3.02 per cent.; South America, 2.08 per cent.; Europe, only 0.74 per cent. The value of the 1929 production has been placed at $403,366,000. The production of gold during 1930 was much greater than in the preceding year, because individual prospectors, working with pick and shovel, were much more numerous, due to unemployment in other lines. It has been said that some owners of large claims threw open their lands to the jobless in order to aid the situation. Probably the same things were true in 1931. The Alaska

production in 1931 was $9,342,000, an increase of almost a million dollars over 1930 production. The California production in 1930 was valued at $9,033,000.

WORLD PRODUCTION

To persons interested in statistics the following figures may appeal. How they were obtained we know not, but they are estimates of the production of gold by various parts of the world from the beginning of history to 1925 inclusive.

United States	$4,142,000,000
Australia	3,426,000,000
Africa	3,481,000,000
Russia and Siberia	1,153,000,000
Colombia	948,000,000
Brazil	801,000,000
Mexico	628,000,000
Canada	597,000,000

The world's production from 1493 to 1925 inclusive has been estimated as nearly $20,000,000,000, of which more than $9,000,000,000 was produced in the period 1901-1925 inclusive. No new fields of importance have been discovered since 1911, and the annual production remained practically stationary at 20,000,000 ounces per year for a number of years, and has been decreasing in recent years.

About the turn of the century there were many known deposits assaying twenty to thirty dollars per ton, but few remain. Most world producers are working on ores containing five to twelve dollars per ton. In Alaska ores assaying eighty to ninety cents are being worked, and in California a copper producing company works ore assaying $1.25 per ton. The high prices of copper, lead, zinc and even iron, a few years ago caused many gold producers to "switch" to the production of these so-called "base metals", and, except for Alaska and South Dakota, in the United States the gold output is still largely a base-metal by-product. The drop in prices of metals other than gold, together with a materially lowered cost of labor and materials, have brought about a revival in the gold-producing industry, many old deposits are being worked again, and a "gold-rush" may come again.

NATURAL OCCURRENCES

Gold occurs in nature both in combination with other elements and in the free state, the latter being the general form. As a sulphide it occurs along with sulphides of such metals as copper, lead, iron and silver; as a telluride it has been found in considerable quantities in certain Colorado dis-

tricts, notably the Cripple Creek district. In the metallic form ("free gold") it occurs in various rock strata in particles of microscopic size, minute pellets, larger pellets, "nuggets" weighing ounces or even pounds (very occasionally), the strata constituting so-called "veins" or "lodes". Where the strata have been exposed to natural forces and the rock distintegrated, the particles or masses of gold are found in the resulting gravel and alluvial soil, and much of the gold produced in the United States in the last century came from just that source. Doubtless, the first gold used by man, and the most of the metal used by him for many years, came from that source, as the separation of it from the associated gravel, sand or earth, is a relatively simple mechanical process.

EXTRACTION

Masses of gold have been found of such size that the finder needed only to pick them up as he would any piece of stone. The largest single mass ever found (so far as the records show) was the "nugget" called "Welcome Stranger" found in Victoria, Australia, in 1869, in a wheel rut a few inches beneath the surface of the earth. It weighed 2520 ounces and was worth about $42,000. One was found in California weighing 280 ounces, one in Russia weighing 96 ounces, one in the Klondike weighing 85 ounces, and one in Arizona in 1931 weighing 270 ounces. Very much smaller nuggets have been found frequently, generally in the sands and gravels of streams along the banks, and in disintegrated rock material resulting from prehistoric glacial action. Most of the gold in this material is in too fine a state of division to be capable of separation by "hand-picking" and must be separated in other ways. This fine gold is the so-called "dust" of the prospector and miner. Much of it is obtained by "washing", by which is meant any process by which natural earth, sand, gravel, or crushed rock is washed away from associated gold by use of water under more or less force. The water does not dissolve the base material but simply carries it away mechanically, its action being largely dependent upon the fact that gold is much heavier than the materials with which it is found.

"Panning" or "Pan-washing" consists in agitating, in a rigid iron pan, a quantity of the gold-bearing earth or sand with water and pouring off the water with its suspended matter, repeating the process until the residue in the pan is chiefly gold, and the larger pebbles which are easily separated. It is a "one-man job". The prospector's outfit may be very simple—a pan, pick, shovel, for tools; a

small tent or sleeping-bag for shelter; bacon and beans for food; and few other inexpensive articles.

"Cradle-washing" utilizes a larger vessel and larger quantities of materials, and may be a two-man or four-man job.

"Hydraulic mining" utilizes streams of water as much as eight to ten inches in diameter under powerful "head" directed against banks of loose earth or gravel. The mixture of water and loosened matter is directed into wooden flumes down the hillside, the gold (except the very finest particles) "hugging" the bottom and collecting in pockets placed at intervals Mercury is often placed in these pockets to take up the gold. Afterwards the mercury is separated from the gold by distillation, to be used over again. This type of mining was started in California in 1852 and continued for thirty years when it was practically stopped by law. The running of the so-called "tailings" into the Sacramento River was considered injurious to navigation, and the fine sediment ("slikens") was assumed to be injurious to farm land in the valley.

"Dredging" originated in Australia about 1865, was first used in Montana in 1894, and in California in 1896, and since then in Alaska and Colombia. It is used in streams and the banks of the streams. In Alaska the "ground" to be worked frequently has to be previously thawed.

All of the processes described are dependent upon the very heavy character of the gold as compared with the other material found with it. This same fact accounts for the usual finding of the so-called "pay-dirt" in alluvial deposits in the first few feet of loose material on top of the "bed-rock".

"Lode-mining" ("Vein-mining") is applied to the extraction of gold from quartz or other rock in which the particles or masses are embedded. The actual mining is similar to that used for any hard mineral—loosening by blasting, handling by hand, shovel, etc. The rock is crushed often in crushers of the type one may see in any quarry where stone is being crushed for road material, but in many cases it requires "stamp-mills" for its disintegration, the stamps being alternately raised and allowed to drop upon the material beneath. The "pulp" is passed over copper plates, commonly fifteen feet by nearly five feet, set at a grade of one and a half inches per foot, the plates coated with mercury. The scrapings are "retorted" to recover the mercury, the "sponge" is then melted with fluxes in graphite crucibles, the metal cast in ingots and then sold as "bullion". Stamp mills

are said to have been used for nearly 4000 years, and mercury quite as long.

At one time wool fleeces were used to "catch" the fine gold, and when one of them contained much gold it was quite properly called a "golden fleece". The Argonauts' search for the Golden Fleece was probably suggested by this practice.

"Chemical Extraction" was first practiced about 1850 and consisted in treating concentrates (even "tailings", occasionally) with chlorine in weak aqueous solution. The gold is converted into a water-soluble gold chloride, and may be recovered as metallic gold by subjecting the solution of the chloride to electrolysis, or by treating the solution of the chloride with some reducing agent which destroys the compound and sets free the gold in fine particles, which needs only to be collected, washed, dried, and fluxed in a graphite crucible to get it into bullion form. This "Chlorine Process" has been largely displaced by the "Cyanide Process", in which the gold-containing material in a fine state of division is subjected to the action of an aqueous solution of an alkali cyanide (formerly potassium cyanide, now sodium cyanide), which takes up the gold to form a water-soluble double cyanide of gold and the alkali metal, from which the gold may be obtained by electrolysis or the action of reducing agents as in the "Chlorine Process". This process may be used to recover gold when in such fine state of division as to be incapable of extraction by any physical process.

LOST GOLD

A little while ago I gave statistics on the production of gold throughout the ages. Some of you may be wondering what has become of it, why one sees so little of it. There are a number of reasons. One is that it is a relatively soft metal and, in consequence, much of it has been lost by being rubbed off the surface of articles made of it or coated with it. Gold leaf is largely used for decorative purposes, gilding, advertising signs on glass, etc., and is not recoverable. Gold-plating is extensively practiced, and only a little of it is recovered. Certain photographic processes use solutions of gold compounds in toning processes, and none of that is recoverable. In some countries, India in particular, gold hoarding is extensively practiced. Some one has estimated that $15,000,000 worth of gold is buried in the United States every year in the mouths of former dental patients. Many millions have gone to "Davy Jones' Locker" in sunken ships. Much has been buried by various people

for safekeeping and its hiding place forgotten. Sometimes the hider has lost his life without having a chance to disclose the hiding place of his hoard to any one else. In October, 1930, a rancher near Deadwood, South Dakota, found a can near a spring, the can containing gold "dust" to the value of $745. Doubtless, other gold containers lie buried in out-of-the-way places in the Rocky Mountains and elsewhere, the finding of any one of which would be a veritable "bonanza" to most any of us. It has been estimated that half of the world's production since 1493 has disappeared, but the value of what is left is not inconsiderable. Late in 1930 the United States alone had in the national Treasury and the Federal Reserve Banks gold to the value of $4,183,000,000, while France had almost $2,000,000,000.

PHYSICAL PROPERTIES

The *color* of gold depends upon its physical form. In the melted form it is bluish-green; in the colloidal form it gives solutions of various shades of ruby, blue and intermediate colors; in the solid form it is a rich yellow. The possessor of articles merely plated with gold, such as cheap jewelry or a safety razor, gets a truer conception of its color than does the possessor of so-called "solid gold", because the latter is practically always an alloy or blend of gold with some other metal or metals, the alloying metal affecting the color more or less—sometimes darkening it, as in the case of copper-containing alloys, sometimes lightening it, as in the case of nickel-containing alloys.

The *hardness* of gold is about that of lead, which means that it is a rather soft metal and unfitted for many uses therefore.

The specific gravity (relative weight as compared with the weight of an equal bulk of water) is high (about 19.5), making gold the heaviest of commonly used metals. Platinum and a few related metals are heavier. A pint of water weighs a little more than a pound—a pint of gold weighs about twenty pounds. Given a cube each of lead, silver, iron and gold, of the same size, the gold would weigh nearly three times as much as the iron, nearly twice as much as the silver, and about one and three-fourths times as much as the lead. This greater weight in proportion to bulk makes it possible easily to distinguish "solid gold" articles from plated ware, and real gold money from imitations.

Gold is a most malleable metal—it can be rolled out or hammered out into exceedingly thin sheets, when it is known as "Gold Leaf", which because of its beauty and permanence of color, is widely used

for decorative purposes. It is said that 15½ grains (1/30th ounce) of it can be beaten out so thin that it will cover a space of nine square feet, and still be opaque enough to hide any other color that might be under it. In "gilding" with it, the article to be decorated is usually first given a coat of varnish or similar liquid, this allowed to become "tacky" and the "leaf" laid on it and lightly pressed down. Sometimes the metal is burnished by rubbing after the varnish has been given time to harden. The ordinary gold leaf is about 1/120,000th inch in thickness. When it is made less than 1/150,000th inch in thickness it transmits light—green if the gold is pure, other colors if alloyed. Gold leaf is available to the trade in 1/250,000th inch thickness. It is said that a five-dollar gold coin will make 500 square inches of leaf 1/150,000th inch in thickness (about 1/1200th the thickness of a sheet of ordinary writing paper).

Gold is a most ductile metal—it can be drawn out into very fine wire, so fine, in fact, that 900 miles of it would weigh only a pound. It has been drawn out so thin that 680 feet of it weighed only a grain. But it must be very pure. Particularly must it be free from lead, as little as 1/2000th part of lead utterly destroying the ductile property. The gold thread used in making gold braid and gold lace for "decorating" the uniforms of army and navy officers is said to be an alloy of ninety parts silver and seven parts copper, plated with three parts gold. An ounce Troy is drawn into 1500 yards of fine wire (thread). About sixteen grains of gold cover about a mile of wire. Truly "all is not gold that glitters".

Pure gold melts at about 1063 degrees Centigrade, or 1955 degrees Fahrenheit, but coinage and jewelry gold melt at very much lower temperatures.

CHEMICAL PROPERTIES

Pure gold is not acted upon by air, water, any common single acid, alkalies, ammonia, or hydrogen sulphide; hence, it does not tarnish or corrode under any ordinary circumstances. It is affected by chlorine, bromine, iodine, alkali cyanides in solution, and easily "amalgamates" with mercury (quicksilver). So far as any harm coming to the gold is concerned, it is not necessary to remove your rings before putting your hands into dishwater, washwater or bathwater. The gold will stand anything that the hands will stand, except mercury. If more people remembered this fact. fewer people would lose their rings by leaving them in the washroom of stores, railroad stations and other public places.

Coinage gold and jewelry gold (particularly that of low gold-content) are affected by hydrogen sulphide (hence, tarnish), sometimes by ammonia (if copper be present, when they turn green), by certain acids (girls have been known to test gifts of gold jewelry with nitric acid—"aqua fortis"), by vinegar if much copper be present.

COMMERCIAL FORMS

Commercially, this metal may be considered as belonging to three general classes—"Solid Gold", "Gold Plate" and "Gold Leaf"—the first class including all forms of the metal which is uniform in composition throughout, whether pure gold or (as is generally the case) an alloy or blend of gold with some cheaper metal or metals; the second class including those forms in which some cheaper metal is covered with a layer of gold; the third class, including the very thin sheets of the metal which are so thin as to have practically lost all tenacity.

"Solid Gold", as before stated (and particularly when this term is used in speaking of jewelry), applies generally to blends of gold and other metals obtained by fusion, and is uniform in composition. As the outside wears away the new surface exposed does not differ in composition from that of the original—does not change as long as anything is left. The alloying metal or metals serve two major functions—that of giving a cheaper metal than pure gold, and also a more enduring metal. Copper and silver have long been used for these purposes, but other metals are used to some extent. The alloying metals affect the color, copper having a tendency to deepen the yellow color, silver having a tendency to lighten the color, while nickel in sufficient quantity practically discharges the yellow color of the gold producing one of the commercial varieties of so-called "White Gold". Twenty-five per cent. or more of silver gives a "Green Gold", as does also cadmium in certain amounts. Zinc in relative large amounts has a similar effect. Alloys of gold and platinum, and gold and palladium, are "white", the latter being sometimes known as "palau", and are used quite extensively in the making of jewelry. They look much like the more expensive platinum. "White Gold" in jewelry has been quite a "fad" for a number of years, and often it has commanded a higher price than its composition would warrant.

The gold content of jewelry gold is usually expressed in terms of the "Karat"—24K meaning pure gold, 12K meaning 50 per cent. gold,

etc. While 12K gold is one-half gold by weight it is only about one-third gold by bulk. Calling it "gold" is really an unwarranted courtesy. An alloy of gold and aluminum, sometimes called "Nurenberg Gold", has practically the color of pure gold, and has the advantage over copper-containing and silver-containing gold alloys of not tarnishing in the presence of sulphur compounds. All of these alloys containing the cheaper metals are very much lighter in specific gravity than pure gold or gold-platinum alloys, this fact making them easily distinguishable from the most costly metals.

"Gold Plate", including "Filled Gold" and "Rolled Gold", as well electroplated ware, being made of a "body" of cheap metal coated with a thin layer of gold, serves many useful purposes. So long as the gold surface is intact it answers most every purpose to which the "solid" gold could be put, and makes it possible for the many who are "poor" in this world's goods to put up as big a "show" in the jewelry line as the wealthy. Gold-plated safety razor holders and other implements in common use testify to the difference in appearance and wearing properties that a thin film of gold on a baser metal can accomplish. The price of these is an indication as to how very thin that coating is.

Gold for coinage purposes is alloyed with a harder metal, generally copper. In this country the alloy is ninety parts gold to ten parts copper by weight, and this alloy is said to be "900 fine"; in some other countries the ratio differs somewhat. In Great Britain coinage gold is "916.66 fine" which corresponds about to the 22K gold of the jewelers. Coins, whether of gold or other metal, are "stamped", and not "cast" as some people might imagine.

At this point it might be well to give the factors which determine the use of gold and silver in the form of coins as money:

Value—because money is the representation of labor, property or something else which is highly valuable to its possessor;

Portability—because money must be easily transportable from place to place;

Divisibility—because money should be capable of being split up into coins of varying values;

Uniformity—because the material of which money is made should not vary greatly, as would other commodities.

Durability—because currency should last practically indefinitely without deterioration.

Distinguishability—because money should possess properties not requiring the services of an expert to identify them.

Freedom from wide and sudden fluctuations in price—a fact which applies to gold in a greater sense than to any other commodity that could be used as a "medium of exchange".

In this country, except for a few of the western States, gold coins are practically "out of circulation", but that is because "Uncle Sam's I. O. U." on a slip of paper is "as good as gold" to the average person, and "why carry metal when the lighter paper is just as good"?

GOLD STANDARD

In these days we hear much about "Gold Standard". We wonder how many people know what the term means. Every unit of measure or value is based upon something taken more or less arbitrarily as a standard. In most of the countries of the world gold has been the standard of money, and is still so in the United States because in Congress March 14, 1900, it was declared that the dollar, consisting of 25.8 grains of gold 0.900 fine "shall be the standard unit of value", and it was declared the duty of the Secretary of the Treasury to maintain at a parity of value with this standard all forms of money issued or coined by the United States. Any other form of money (paper, silver, nickel, bronze, etc.) has value merely because it can be converted into gold at will, or because the Federal government's promise to redeem it at face value is still good. From time to time there have appeared in the newspapers items telling of the prospects of the monetary systems of the world being completely upset through somebody discovering a process by which lead, mercury or some other relatively cheap metal can be converted into gold; but, thus far, there has been but little cause for a scare of that kind. It is well not to take too seriously the following excerpt from an editorial in "Power Plant Engineering" December 1, 1931:

> "What is Gold? In the language of the scientist today it is simply an atom with 79 electrons around the nucleus. There is not a great deal of gold in the world—all of it could be put in a cubical room 30 feet on a side. Like gold, lead is also an element but with 82 electrons around the nucleus—and there is a great deal of lead in the world. Now what is going to happen when comes that inevitable day when the 3 electrons will be knocked off the lead atom, leaving gold in its place? . . . The high priests of international finance then will have something else

to think about than shuffling back and forth the existing stocks of the world's 79-electron metal. Their so-called theories of the gold standard will become meaningless, and we shall have a revolution of values such as the world has never seen. We may yet have solid gold turbines and platinum boilers."

The editor overlooked the fact that the lead atom will have to lose something else beside three electrons from its surface (its "skin", as it were), but will have to undergo a chemical "laparotomy" and be deprived of ten protons and some more inner electrons—a "major operation" which is likely to cost more than its results could ever warrant.

Conclusion

In the prospectus of this lecture, gold was referred to as:

a. A *precious* metal—because of its relative scarcity;

b. A *noble* metal—not because its possession is confined to the nobility, else most Americans could be considered as of the nobility (many of them consider themselves "peers" now). Poor indeed is the person in this country, even in these troublous times, who does not own at least some trinket with a bit of gold on it. No, a *noble* metal is one which is practically incapable of oxidation or corrosion of any kind, even at high temperatures.

c. The *"king"* among metals—because of a combination of useful characters.

d. A *servant*—not the most profitable of man's metallic servants but, as Thone says, "doing well what it can do".

Of the psychological effects of gold on man we have said nothing. From one man it can bring out the best that is in him, (be "an instrument of the Lord", as it were); from another it brings out the worst (be "a tool of the Devil", as it were). What a blessing—yet what a curse—it has been to mankind in the thousands of years that have elapsed since the first glittering particles of it were picked up by some especially observant "Son of Adam".

MEDICAL AND PHARMACEUTICAL NOTES

ROTENONE FOUND IN COMMON AMERICAN WEED—The Devil's Shoestring, a common weed in the eastern half of the United States, contains rotenone, a U. S. Department of Agriculture chemist has found. The discovery is significant for farmers, both as potential growers of the plant and as users of the insecticide, to insecticide manufacturers, and to importers who carry on international trade in rotenone and other insecticides.

W. W. Skinner, assistant chief of the Chemical and Technological Research Unit of the Bureau of Chemistry and Soils, first called attention to the probable insecticidal value of devil's shoestring, following his observation that bees and other insects fed on nearby plants but avoided the blooms of this toxic weed. Doctor Skinner later instigated the research which led to the recent discovery of this weed's rotenone content by E. P. Clark of the bureau's insecticide division. Although the insecticidal value of devil's shoestring, was demonstrated about two years ago by V. A. Little, of the Texas Agricultural College, who found it effective against various species of insects, its value as a source of rotenone was not known until proved by the department's research.

Rotenone, which is used for much the same purposes as pyrethrum and nicotine insecticides, has been extracted chiefly from derris, a vine from the East Indies and from the root of cubé, a South American shrub. It is deadly to many insects, but it does not poison man or animals.

The devil's shoestring, *Cracca virginiana,* is the first North American plant found to contain rotenone. This plant is also known as the wild pea. Related species are found in tropical countries. The discovery of rotenone in this American plant promises to make the United States independent of foreign sources for insecticides made of rotenone.

The rotenone is found chiefly in the root of the plant. Rotenone and other constituents of an insecticidal nature make up 4 or 5 per cent. of the roots. Department scientists believe this could be increased by selection and breeding, much as the sugar content of sugar

beets has been increased. Rotenone now costs about the same as the pyrethrins, the active principles of pyrethrum flowers, but the department scientists believe that as its use increases it will become cheaper. It is rapidly coming into use in greenhouses, for truck crops, and for combating fleas and other external parasites on animals. Spray material, containing about 5 per cent. rotenone, has recently sold for about $10 a gallon. A gallon of this material is diluted to make about 800 gallons of spray.—(*News Edition,* Jour. A. C. S. Jan., 1933, *16.*)

A Color Test for Rotenone—The method finally adopted as most suitable for a qualitative test for rotenone consists of the following steps:

One cubic centimeter of an acetone solution of rotenone is treated with 1 cc. of 1 to 1 nitric acid, and the mixture allowed to stand for 0.5 minute. It is then diluted with 8 to 9 cc. of water and 1 cc. of strong ammonium hydroxide added. A blue color is produced which is almost identical with that given by bromothymol blue indicator at a pH of 7.2. As little as 0.1 mg. of rotenone can be detected by this method.

Several pure materials related to rotenone were tested by the method just outlined, to see if they would interfere. One milligram of material per cubic centimeter of acetone solution was used. Deguelin gave a test apparently identical with that given by rotenone. Tephrosin gave no blue color, and toxicarol only a very faint blue as compared with a deep blue for rotenone at this concentration. Dihydrorotenone, isorotenone, and rotenone hydrochloride also gave about the same depth of blue color as rotenone. Dehydrorotenone and rotenonone, oxidation products of rotenone, gave no blue color. Acetone extracts of pyrethrum flowers and tobacco did not give the test.—A. Jones and C. Smith, *Journ. Ind. and Eng. Chem.,* Jan., 1933, *75.*

Metallic Calcium—Metallic Calcium has been known since 1808, when Sir Humphry Davy made it in an impure state by reducing calcium oxide with metallic sodium. Ninety years later, Moissan produced the pure metal by the same process, but now it is manufac-

tured quite readily by elctrolyzing molten calcium chloride. It is harder than tin or lead, almost as hard as aluminum, and consequently has been used in light aluminum alloys, and in lead-barium-calcium alloys known as Frary metal, for anti-friction bearings, particularly during the War, when there was a shortage of antimony. Lately a range of lead and calcium alloys which harden with age has been discovered, alloys which are particularly adaptable as sheathing material for electric cable.

The principal uses for metallic calcium at present, however, center around its chemical and chemico-physical rather than its metallic properties. While, unlike sodium, it can be handled without danger, it it is a powerful reducing and dehydrating agent and is an absorbent for gases. These properties make it useful in the deoxidizing and desulfuring of carbon steels and cast irons, the latter being claimed to have a slightly higher density than that of the usual product. Calcium pellets are shot with an air gun deep into a ladle of molten metal, where they react with greater rapidity, the calcium rising to the surface with the slag in the form of lime.

Calcium in very small amounts has been used to deoxidize copper, giving it increased ductility with more uniform grain size, while at the same time reducing the electrical conductivity to a much lesser extent than does zinc, beryllium, barium, strontium or lithium. It has been reported to be a useful reagent in the purification of inert gases, and in the dehydrating of oils and alcohols, as well as the fixation of atmospheric nitrogen.

The chief barrier in the way of the utilization of this metal has been, and still is, the cost of production. However, the price, which was about $20 per pound fifteen years ago, is now in the neighborhood of $1.50, and if uses are found which increase the volume of production sufficiently it is anticipated that the cost will be brought in line with other more common metals.—(*Bulletin of Arthur D. Little.*)

Crystalline Vitamin D—The production of antirachitic substances of remarkable potency by suitable irradiation of inactive components of animals and plants represents one of the notable biochemical contributions of recent years to medicine.[1] The most important, if not actually the only substance that assumes antirachitic potency on

exposure to ultraviolet rays is ergosterol, a formerly little known sterol, a crystallizable compound that can be secured in abundance in a state of great purity. The irradiated derivative of ergosterol, viosterol, which is assumed to be comparable if not actually identical in action with vitamin D, may exhibit a physiologic potency many thousand times that of cod liver oil, the foremost antirachitic product that occurs naturally.

It has been apparent for some time that the irradiation products of ergosterol represent a mixture of substances of which only a varying proportion is the active vitamin D. Consequently the question has arisen whether the toxicity known to be exhibited by very large doses of irradiated ergosterol are due to the vitamin itself, so that one could speak properly of hypervitaminosis, or to contaminating derivatives produced by the transformations of the natural sterol. Considerable progress has been made more recently by the fractional purification of the products of ergosterol irradiation resulting in the isolation of crystalline substances of noteworthy potency out of the mixtures formerly obtained. Investigators in several countries have been active in this field of research. The latest report, by Professor Windaus [2] of Göttingen, perhaps the leading student of the subject, records the isolation of what appears to be the antirachitic vitamin D in pure crystalline form. At least five other concomitant products of the irradiation process have also been separated—most of them in crystalline form. None of these, including "lumisterin," "tachysterin" and "suprasterin I and II," exhibit antirachitic potency. This is, indeed, a great step in advance. It appears, furthermore, that vitamin D can be formed by further suitable irradiation of the primary alteration products (lumisterin and tachysterin) of ergosterol. The chemistry of the subject has proved to be difficult.

The pure vitamin D of Windaus is remarkably stable, and unlike some of the other vitamins it is scarcely affected under ordinary conditions by oxygen. One milligram (one sixty-fourth grain) of the purest crystalline substance is equivalent to at least 40,000 international D units in antirachitic potency, as tested by biologic methods. The refined products derived by different methods of irradiation used in different laboratories are apparently identical.

In her review of the subject a few months ago, Clouse discussed in detail the much debated question of the possible toxicity of vitamin D. She wrote: "At present it must be said that the case for the ex-

istence of a separate toxic factor, distinct from vitamin D, has not been proved. That there is strong evidence for such a factor cannot, however, be denied, and the results of future work must be awaited to settle the point." Windaus and Lüttringhaus have come to the conclusion that the pure vitamin D is not entirely devoid of toxicity. A dose of 0.075 mg., representing 3,000 international D units, is toxic to mice. But tachysterin, which is present in unpurified irradiation products, while inactive as an antirachitic agent, is decidedly more toxic. The relative toxicity of pure vitamin D has been demonstrated to be far less than that of its common contaminants. Whether the naturally occurring vitamin D of cod liver oil is actually identical with the chemically produced compound remains to be ascertained. Nevertheless the investigations here recorded represent a great triumph of scientific research in medicine.—(*J. A. M. A.*, Feb. 11, 1933, p. 426.)

1. These investigations are briefly reviewed by Clouse, Ruth C.: Vitamin D, *J. A. M. A.*, 99:215 (July 16th), 301 (July 23) 1932.
2. Windaus, Adolf, and Lüttringhaus, A.: "Ueber das bestrahlte Ergosterin," *Deutsche med. Wchnschr.*, 58:1669 (October 21) 1932.

NEWS TEMS AND PERSONAL NOTES

HARRISON S. HIRES, NEW PRESIDENT OF PHILADELPHIA DRUG EXCHANGE—The Philadelphia Drug Exchange held its seventy-second annual meeting January 24, in its offices in the Bourse Building. A general review of business conditions in the lines embraced by the activities of the exchange was presented by the secretary, Joseph W. England. A report in memory of deceased members and trade associates of the exchange was also presented.

The following officers were elected: President, Harrison S. Hires, of the Charles E. Hires Company; vice-president, Benjamin S. Thorp; secretary (re-elected), Joseph W. England; treasurer (re-elected), F. L. Bodman; directors (re-elected), J. Mervin Rosenberger, H. K. Hineline, H. H. Whyte, Walter V. Smith and E. L. Brendlinger; (new members), John F. Belsterling, Raymond G. Anderson and Paul S. Pittenger.

NEW PHARMACEUTICAL RESEARCH FELLOWSHIP—The National Conference on Pharmaceutical Research announces its second fellowship.

1. *The name of this fellowship* is "The Fellowship of the National Conference on Pharmaceutical Research." The amount of this fellowship is five hundred dollars ($500).

2. *Qualifications of the Recipient:* The recipient must hold a bachelor's degree from a recognized school of pharmacy.

3. *Basis of Award:* The fellowship will be awarded for high scholastic attainment and for research ability as evidenced by research completed or conducted and published, or intended for publication.

4. *How the Fellowship Shall be Awarded:* The fellowship shall be awarded at the discretion of a committee of the National Conference on Pharmaceutical Research. This committee is composed of the chairman, secretary, treasurer and two other members elected by the executive committee. Notice of the meeting of this committee for consideration of the award shall be given to the deans of recognized schools of pharmacy, advising them to notify the graduate students, and also the pharmaceutical press at least three months prior to the annual meeting of the National Conference on Pharmaceutical

Research. The award shall be made at the last general session of the American Pharmaceutical Association.

5. *Purpose of the Award:* The purpose of this fellowship is to establish under the direction of the pharmaceutical faculty a ten months' scholarship in a graduate school, awarding a doctor's degree that is recognized by the graduate faculty of the university or other generally accepted academic evaluating agencies.

6. *Disposition of Research:* The research conducted under this fellowship shall be presented after completion to a recognized pharmaceutical journal for publication.

For further details regarding the awarding of this fellowship, applicants are advised to address the Secretary of the National Conference on Pharmaceutical Research, John C. Krantz, Jr., Secretary, National Conference on Pharmaceutical Research, 2411 North Charles Street, Baltimore, Maryland.

JEFFERSON MEDICAL COLLEGE GRADUATES HONORED—Dr. Wilmer Krusen, president of P. C. P. & S., and Dr. Lewis C. Scheffey, 1915, president of the alumni association, were hosts, January 18, at a reception to the graduates of the College who are members of the teaching staff at Jefferson Medical College.

The guest of honor was Dr. E. Quinn Thornton, 1889, who is in his thirty-ninth year of service at Jefferson and is now professor of therapeutics there.

Other graduates of the College who are members of the Jefferson teaching staff, include Dr. Edward J. Klopp, 1901; Dr. Henry K. Mohler, 1907, and Dr. Lewis C. Scheffey, 1915. In all 139 graduates of this College are also graduates of Jefferson.

Trustees and faculty of the College and officers and members of the alumni association were on hand to welcome them. A buffet lunch was served.

SWAIN AND KRANTZ TESTIMONIAL DINNER—On Tuesday evening, February 7, the pharmaceutical organizations of Maryland joined hands in tendering to Doctor Robert L. Swain and Doctor John G. Krantz, Jr., a testimonial dinner in honor of their election as president and second vice-president, respectively of the American Pharmaceutical Association for 1933-1934. A large number of people from Baltimore and the State at large attended the dinner, as well as a number of distinguished guests from nearby States.